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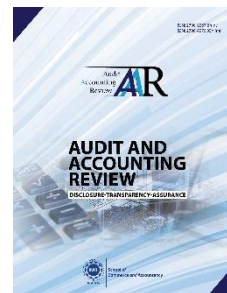DISCLOSURE-TRANSPARENCY-ASSURANCE

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Role of Financial Development on Economic Complexity: An Empirical Evidence from 33 BRI Countries

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Abstract

Economic complexity plays a prominent role in the economic development of countries. So, economies need to improve their level of product sophistication. Several, researchers have mostly neglected the concept of economic complexity and its detrimental factors. Few economists have determined economic complexity with the help of socioeconomic determinants, while others have determined economic complexity through financial development index and institutions. This study employed the Generalize Method of Movement (GMM) to estimate the empirical inferences to cater the effects of endogeneity. Fiscal policy stances such as the log of final government consumption, GDP per capita income, institutions, and the lagged economic complexity have shown a positive and enormous impact on economic complexity. The findings of the current study have elucidated that the financial development index itself is negatively insignificant for economic complexity. However, after introducing the term 'interaction' with 'institutions', it reflected a positive and significant impact on economic complexity. So, as a policy measure, the selected sample BRI countries must regulate their finance system which would improve their institutional structure.

Keywords: Belt Road Initiative (BRI), economic complexity, Generalize Method of Movement (GMM), institutional structure.

Introduction

Financial development became a part of the economic paradigm when Schumpeter (1912) introduced the importance of the financial market for accelerating the economy. According to the definition of the World Bank, the financial sector is a set of factors like market instruments, institutions, and legal and regulatory systems used for the expansion and efficient flow of credits. In this, the banking sector plays a prominent role in accelerating economic growth by maintaining the balanced circulation of money through major important activities. These activities involve bank deposit on which banks provides interest rate to the depositors and money lending to the private sector for investment and for personal use, on which bank charges

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interest rate from the borrowers. Goldsmith (1969) and McKinnon (1973) were primitive researchers who introduced the relationship between financial development and economic growth, which remained a debatable topic in developing economies. The primal theory about the impact of financial development on economic growth realized that a well-defined and well-structured financial system could play an indispensable role in curtailing monitoring, transactions, and information costs. A modern financial structure could play an important and unforgettable role in the mobilization of scarce resources efficiently and could allocate these resources in a way that might become helpful in enhancing the physical and human capital, which in return would accelerate economic growth (Creane et al., 2004). However, Zhu and Li (2017) have predicted that economic complexity has a positive relationship with economic growth. Economic complexity is an indicator of a country's product sophistication, as complexity represents the knowledge and technology level of a country from manufacturing to export. Economic complexity is the total and technical knowledge that is embodied in a production structure (Balland et al., 2022; Balsalobre-Lorente et al., 2022; Gnangnon, 2021; Nguyen & Su., 2021). Moreover, countries with high knowledge and capabilities would significantly perform and participate well in social production with high efficiency. Felipe et al. (2012), Lewis (1950), and Rostow (1959) have exposed that structural transformation and increased productivity could lead to economic development.

Figure 1

Financial development index data for 33 countries of BRI participants (2020)
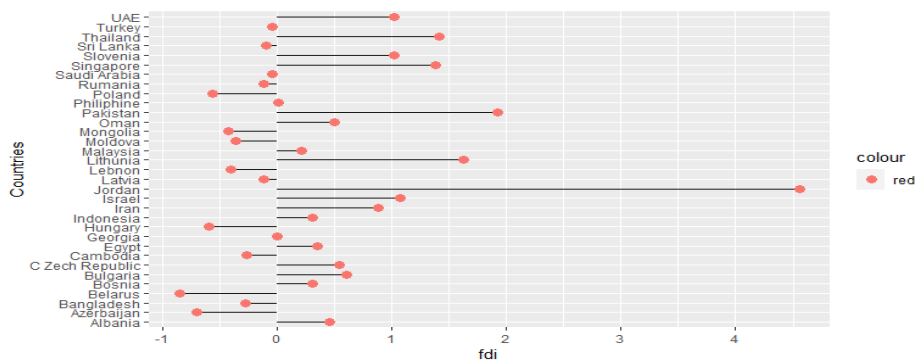
Source: Developed by the authors

Highly sophisticated products and complex production structures require high technical knowledge, specialization, and new technological innovations. , Bagehot ([1873]), and North ([1987]) also argued that an efficient financial system could reduce transaction costs and could also accelerate the specialization of economic agents. Greenwood and Smith ([1997]) also predicted that a well-arranged financial structure has a positive relationship with specialization. Cooley and Smith ([1998]) have constructed a model which ensures that growth occurs endogenously. This also indicates that when the financial sector is efficient, then specialization is possible. This innovation process is not only lengthy, unique, and fickle but it also has a chance to collapse. Due to lack of information, encouragement, complications, innovation, and modernization, enterprises face economical, monetary, and financial restraints. Financial sectors accelerate innovative programs with the help of lowering financing costs, promoting innovation activities, and managing the risks associated with it (Aghion et al., [2005]; Levine, [2005]), (Aghion et al., [2009]). Hall and Lerner ([2010]) and Rajan and Zingales ([1998]) have predicted that financial lift could encourage new firms to finance their innovative programs. Xiao and Zhao ([2012]), Aghion et al., ([2018]), and Zameer et al. ([2020]) have empirically pointed out that financial development has a positive and significant impact on innovations. The above stated discussion, declared that economic complexity has a positive relationship with financial development as economic complexity is based on technical knowledge and innovations prevailing a productive structure of economy, which is productive for the economic growth.

Table 1

Top Countries with High Economic Complexity Index

Countries	Economic Complexity in 2019	Economic Complexity in 2020
Japan	2.82	2.49
Germany	2.38	2.13
Switzerland	2.27	2.07
UK	2.11	2.05
Sweden	2.09	2.00
United States	1.99	1.80

Countries	Economic Complexity in 2019	Economic Complexity in 2020
Finland	1.97	1.77
Austria	1.87	1.75
Ireland	1.65	1.64
France	1.65	1.63

Source: Data compiled from Observatory of Economic Complexity

Figure 2

Economic Complexity Index Data for 33 Countries of BRI Participants (2020)
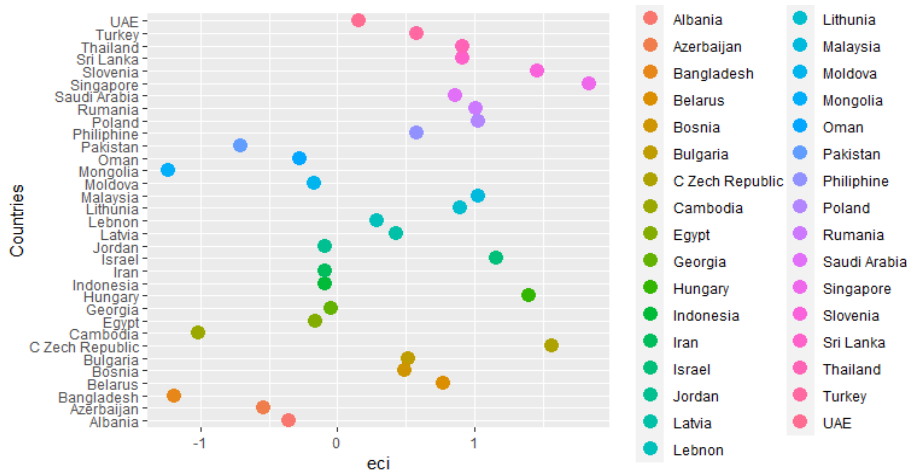
Source: Developed by the authors

Financial development alone might not be sufficient to lead to a majestic ramification of economic complexity without the dynamic institutional framework. Every transaction has its own transaction cost like search cost, enforcement cost, and measurement cost. North ([1989](#)) has argued that complicated and precarious deals require the third parties to play their roles as a mediator for enforcing the contract to its final stage. In a deep perception, lawful institutions could impact the corporate finance and the enforcement of legal private contracts efficiently. The impressive legal institutional structure allows the appreciative and brilliant financial market competitors to lay out a boundless bunch of refined private contracts to

mitigate convoluted agency dilemmas (Coase, 1960; Fischel & Easterbrook, 1991). For this, the court could play a magnificent and effective role to make the way of enforcement smooth by prosecuting private contracts equitably (Glaeser et al., 2001).

Financial institutions also lend to the private sector in the form of bank credits. These private sectors use these loans and make their production structure more complex by providing technical skills to their existing labour force which would indirectly reduce the turnover cost. These financial sectors also provide loans to the government to finance their budget deficit to meet their education, health, and other expenditures. These expenditures on health and education in return provided skilled and effective individuals/labour to stabilize the economy, by making the whole structure more productive.

There is no doubt that we have declared the world a global village, but the differences are still prevailing regarding the productive structure among different economies. Several, researchers have tried to highlight the main reasons behind such differences by using different socio-economic and financial determinants for economic complexity. However, the literature related to economic complexity is limited and deficient. Previous literature has predicted the impact of financial development on economic complexity. The analysis declared that there was hardly any significant study that probed the impact of interaction in terms of financial development and institutions of 33 countries that were a part of the Belt and Road Initiative (BRI). In such a regard, this study is novel as it aims at bridging the above research gaps.

Literature Review

Extensive literature related to economic complexity has already been available, however, this section elaborates on some significant studies present on this relevant subject. Horobet et al. (2022) have highlighted the relationship between financial development, education, and digitalization using the data of European economies and emerging economies of Europe for the years from 1996-2019. Their findings depicted that education has a positive impact on financial development and also on the digitalization. Nguyen and Su (2021) investigated the impact of financial development on economic complexity in 86 countries for the data from 2002-2017. Their

empirical inferences pinpointed that the financial sector has a positive relationship with economic complexity.

Njangang et al. (2021) have also investigated the impact of financial development on economic complexity in 24 African countries for the years from 1983-2017. The findings exposed that there is a positive abiding relationship between financial development and economic complexity in African countries. Gnangnon (2021) has also analyzed the data of 126 developed and developing countries. Hence, the current study investigated the impact of productive capacities on economic complexity. The results of the study have confirmed that productive capacities could accelerate the economic complexity. In a likewise manner, Kannen (2020) has also used the data of 63 developing and developed countries for the years 2005-2014. The inferences of the study portrayed that foreign direct investment (FDI) could improve the quality of the productive structure of the economy that has been already measured by the economic complexity index.

Similarly, Chu (2020b) used data from 94 countries for the years 1968-2015. Using the generalized method of moments (GMM), the current study predicts that the stock market and banking sector has a positive impact on economic complexity. Furthermore, Gala et al. (2018) predicted that there is a positive long-run relationship between economic complexity and sectoral employment structure. Javorcik et al. (2018) have investigated that Turkish firms has introduced more complex product that received foreign direct investment. In this, Valette (2018) has significantly, explored the relationship between migration and economic complexity. The results indicated that migrants could also use foreign technology to enhance the level of economic complexity in their home country. Amendolagine et al. (2017) have declared that FDI has a positive relationship with economic complexity in Africa. Azam (2017) has also investigated that cognitive skills could enhance economic complexity positively. Hartmann et al. (2017) used data of 150 countries for the years 1963-2008. They predicted that countries which were exporting complex product and have a strong institutional structure coupled with low income inequality. Whereas, countries which were exporting simple product have inefficient institutional structure and high income inequalities. The results confirmed that economic complexity could also get effected by the income inequality and by the quality of institutions.

Bashir et al. (2022), You et al. (2022) and Sweet and Maggio (2015) have pointed out that intellectual property rights have a positive impact on economic complexity. Hsu et al. (2014) has also used data of 32 developed and emerging economies to explore the impact of financial development on technological innovations. Their findings elucidated that the development of the equity and credit market has a positive relationship with high technological innovations. Saadi (2014) has also investigated that foreign direct investment (FDI) could improve the quality of exported products in emerging economies. Harding and Javorcik (2012) has also pointed out that FDI could improve the quality of exported products in developing countries.

From the existing literature, we concluded that   most of the studies predicted the impact of socioeconomic variables on economic complexity. However, there is hardly any significant study that has explored the impacts of interaction terms of the financial development index and institutional index on economic complexity in 33 countries that are going to be a part of the Belt Road Initiative which   China has organized.

Data Description

This section of study reveals the description of the data.

Economic Complexity

Economic complexity was first introduced by Hidalgo and Hausmann (2009). The economic complexity index is also known as the 'sophistication of production structure' which is primarily based on two factors; (i) product ubiquity and (ii) country diversity. Product ubiquity means that the product has limited suppliers as it requires high skills and technical knowledge to produce the ubiquitous product. While country diversity means that country has a variety of export commodities. Hartmann et al. (2017) have also used the economic complexity data for his study. The economic complexity data was available on the Observatory of Economic Complexity (OEC)[†].

Financial Development Index

Financial Development Index (FDI) comprises liquid liabilities, bank credits to private sectors, and broad money. This index was developed from Principle Component Analysis (PCA). The data on financial development has been collected from World Bank Development Indicators (WDI).
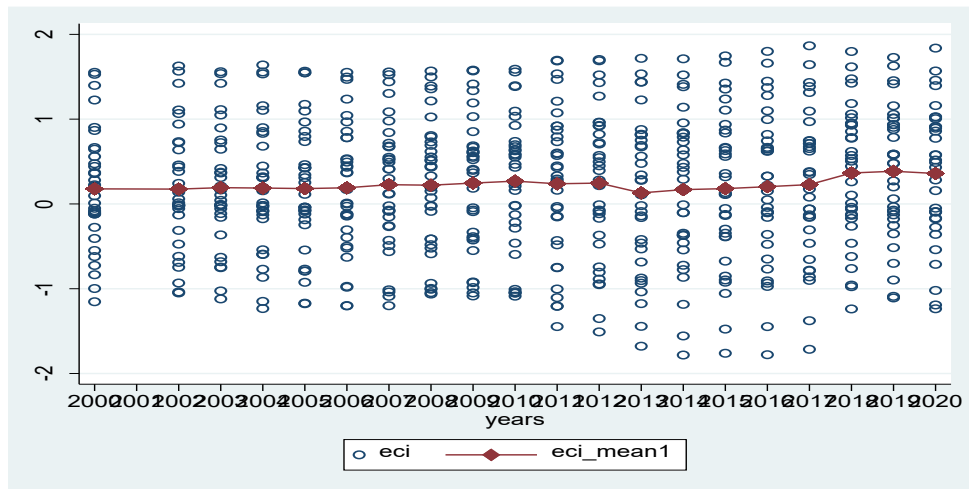

[†] Please for detail visit: https://atlas.media.mit.edu/en/rankings/country/eci/

Financial Development Index has also been used by Khan and Qayyum (2007), Rahman (2004), Fase and Abma (2003), and Tahir (2008).
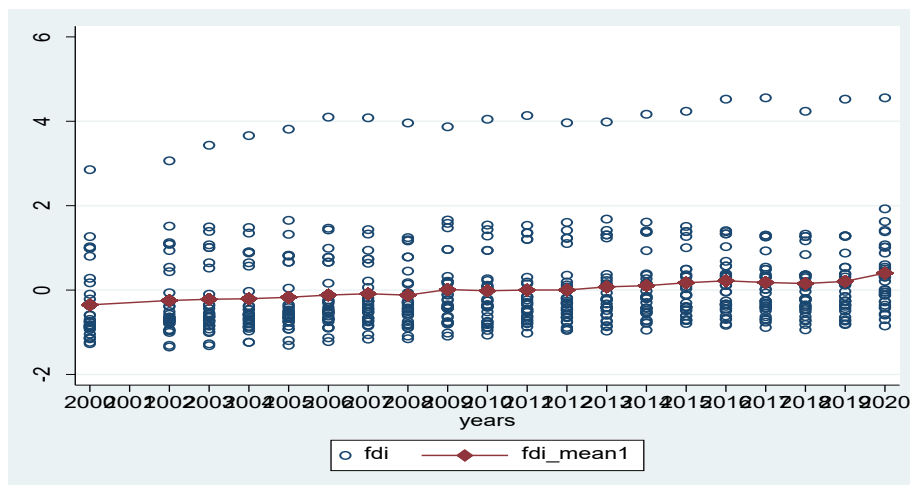
Figure 4

Variations of Economic Complexity Data

Source: Developed by the authors

Figure 5

*Variation of Financial Development Index*

Source: Calculated by the authors

Institutional Structure

Institutions are a humanly self-designed constraint. In other words, they are attributed to the rules of the games, where organization are playing fields and rules are institutions (Aslam, 2020; Aslam & Farooq, 2019; Aslam et al., 2021; Aslam & Shabbir, 2019; Aslam et al., 2017; Aslam & Zulfiqar, 2016; Qamar et al., 2020). Institutions play an effective role in indicating human interaction regarding society, economy, and politics smoothly (North, 1990). Institutions are measured through six world governance indicators (WGI), which include; (i) voice and accountability, (ii) political stability and absence of violence, (iii) control of corruption, (iv) regulatory quality, (v) government effectiveness and (vi) rule of law. An institutional index is developed on the bases of the above six indicators using Principal Component Analysis (PCA). Through the transformation of most correlated variables into uncorrelated linear variables, the orthogonal transformation has been used in PCA (Madni & Khan, 2019).

Figure 6

Variations of Institutional Index Data
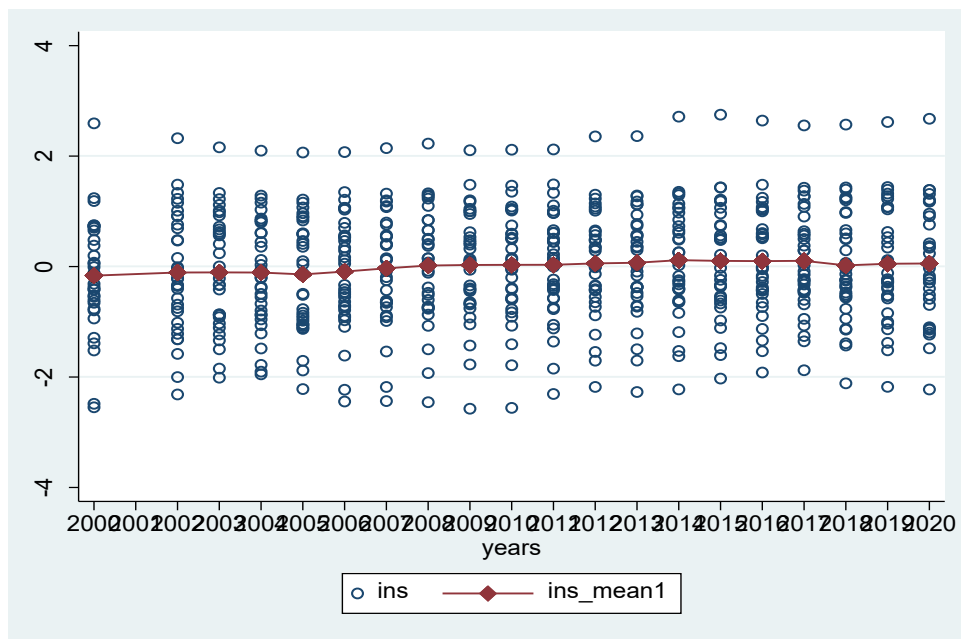
Source: Calculated by the authors

## Log of General Government Final Consumption Expenditure to GDP

The general government's final consumption expenditure to GDP is an indicator to measure the country's financial stability. Hence, it highlights the total annual consumption of the government to purchase goods and services. This indicator excludes the consumption of military expenditures. Chu (2020a) has also used financial consumption expenditure as an independent variable to analyze the economic complexity.

Log of Per Capita Income

Per capita income could be obtained if we divide the market value of the annual total goods and services by the country total population. Alaya (2012), Longmore et al. (2014), Madni and Khan (2019), and Yalta and Yalta (2021) have also used this variable as a control variable in their previous studies.

Figure 7

Variation of Control Variables
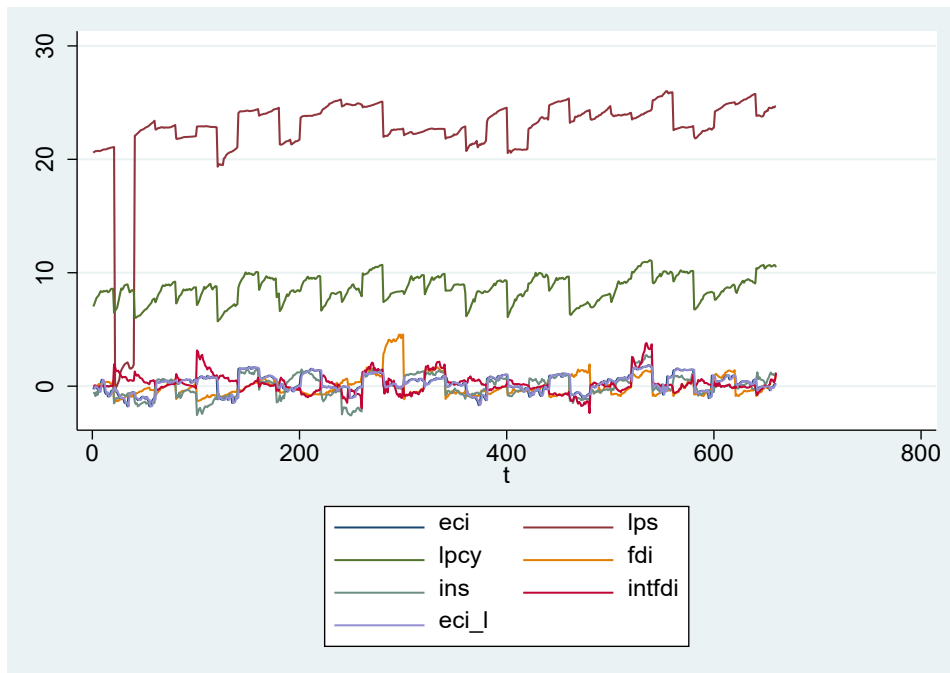
Source: Calculated by the authors

Model Specifications and Methodology

The panel sample size of the current study comprises 33 BRI participating countries for the years 2000-2020. Since the study's sample contains N, which is greater than T, hence, we could also apply GMM to cater the endogeneity that might rise due to the inclusion of institutions in our analysis.

The empirical model has specified form of an equation:

$ECI_{it} = \beta_0 + \beta_1 Eci_{(t-1)} + \beta_2 LGE_{it} + \beta_3 FDI*INS_{it} + \beta_4 LPCY_{it} + \beta_5 INS_{it} + \beta_6 FDI_{it} + \varepsilon_{it}$ .... (1)

Dependent Variable

The dependent variable is ECI. ECI is denoted below;

ECI= Economic Complexity Index

Independent Variable

Below is the list of independent variables;

$ECI_{(t-1)}$ = Lagged dependent Variable economic complexity

LGE= log of government expenditures

FDI*INS = Interaction term of financial development and institutions

 LPCY= Log of per capita income

INS= Institutional index

FDI= Financial development index

ε = Error term for the model

`i` and `t` subscripts in equation (1) showed the countries/entities time period respectively. Therefore, one-step-system Generalized Method of Movement (GMM) is used for the findings of empirical inferences which have been proposed by Arellano and Bover (1995) and Blundell and Bond (1998). GMM is useful for several reasons which are stated as; (i) GMM could cater to the problem of endogeneity, (ii) it reduces the biases which is the outcome of a country-specific effect, and (iii) it has the power to curtail reverse causality and simultaneity problem. Therefore, in this current research lagged dependent variable is used as an explanatory variable, which makes the model a panel data model.

Results and Discussions

The p-values from the empirical findings (Table 2) elucidate that lagged economic complexity is positively and strongly significant at 1% of the significance level. Thus, this result shows consistency with the outcome of lagged economic complexity. Kamguia et al. (2022) and Yalta and Yalta (2021) have also reported similar findings. The log of the measure of fiscal policy stance, measured by government final consumption for goods and services was positive and highly significant at 1% of the significance level. Hence, the results were consistent, similar to the result of Chu (2020a).

Table 2

One-step System GMM Results

Variables	Co-efficient	Std. Error	t	$P>|t|$
Constant	-0.738623 ***	0 .1294196	-5.71	0.000
Economic Complexity	0.8058539 ***	0.0180402	44.67	0.000
Govt. Expenditures	0.0108955 ***	0.0029427	3.70	0.000
FD*Institutions	0.0228531 *	0.0126579	1.81	0.071
Per capita Index	0.0616169 ***	0.013516	4.56	0.000
Institutions	0.0228531 *	0.0126579	1.81	0.071
FD	0.0616169 ***	0.013516	4.56	0.000
Countries		574		
Observations		33		

The interaction term of the financial development index with institutions is significant at 10% of the significance level. The results confirmed that financial development could reinforce economic complexity only in an efficient institutional structure for BRI participants. The log of GDP per capita income was also positively significant at a 1% of the significance level. Results of these variables showed consistency with the results of Chakraborty et al. (2020). In this institutional index has a positive and significant relationship with economic complexity at 1% of the significance level. Hence, the obtained results were consistent with Rehman et al. (2020). The financial development index was negative and

insignificant. However, it became positively significant after introducing its interaction with institutions.

Conclusion and Policy Implications

The current study investigates the impacts of financial development on economic complexity by collecting a sample from 33 countries which were expected to be a part of the Belt and Road Initiative (BRI). One-step system GMM was applied for the panel data estimations. Furthermore, this current study firstly, documented the existence of bi-directional causality between economic complexity as it was among both cause and effect factor. This research analysis primarily showed that government expenditures, per capita income, and institutions have a significant positive impact on the economic complexity of a country. Still, for the financial development index, the results were more diversified as its impact was negative and insignificant. The results from the inclusion of institutions predict that the institutional structure provides the infrastructure for economic growth and acts an enabling variable. This means improving financial development in which institutions play a vital role towards attaining a better picture of economy. The proposed suggestion for policymakers of financial market's efficiency in financial development appears to have a positive influence as financial markets offer an alternative way of funding, skill enhancement, and the spread of knowledge. Hence, policies might be designed to improve the financial development, however, it is impossible to attain financial development without the efficient working of institutions. Thus, the institutional structure needs to be strengthened at first to gain maximum benefits.

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